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Attitudes toward the environment: a curriculum evaluation project on promoting deaf students' awareness of environmental issues

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Attitudes Toward the Environment:

A Curriculum Evaluation Project on Promoting Deaf Students' Awareness of Environmental Issues

Master's Project

Submitted to the Faculty
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of Students who are Deaf or Hard of Hearing

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Abstract

With the increasing importance being placed on the awareness of the environment in today's society, one wonders how Deaf[1] students' attitudes toward the environment are influenced by their experiences or by taking a course on the environment. This Master's Project provides a rationale for the need for Environmental Science courses in Deaf Education.

The study examined whether the attitudes of postsecondary Deaf students may be influenced by an academic course. Seventeen students enrolled in an Environmental Science course at NTID took a pre and post survey to study the change in attitudes. Students completed the Environmental Science course as a treatment in between surveys. The results of this study showed that students benefited from the course with a statistically significant increase in the mean scores for the evaluation of their attitudes toward the environment. This study showed how increased knowledge of issues related to environmental science can lead to the development of more positive attitudes.

Knowledge about the environment should be everyone's concern, not just a topic for the classroom. This project provides support for the view that a well-designed course with effective instruction can make a difference in both learning and attitudes. In turn, students can make a difference by applying that knowledge to their lives as well.

[1] The term Deaf will be used to include the range of students from profoundly deaf to functionally hard of hearing.

Attitudes Toward the Environment: A Curriculum Evaluation Project on Promoting Deaf Students' Awareness of Environmental Issues

Project Overview

The purpose of this project is to study the attitudes of Deaf students about the environment and how learning about the environment may influence these attitudes. A curriculum project website was developed with an emphasis on environmental issues for an eleven-week course on the Associate degree level. Such a course would require minimal modification if taught to high school seniors as well.

Importance of the Project

"Attitude" is defined, according to *Oxford American Dictionary*, as "a way of thinking or behaving." "Awareness" is defined as "having knowledge or realization." Both attitudes toward and awareness of environmental issues are expectations found in the National Science Education Standards (NSES): "Certain attitudes, such as wonder, curiosity, and respect toward nature are vital parts of the science learning community. Those attitudes are reinforced when the adults in the community engage in their own learning and when they share positive attitudes toward science" (NSES, http://www.nap.edu/readingroom/books/nses/html/3.html).

Students in grades 9-12 should, according to the NSES standards, develop understanding of environment-related issues in several broad areas. *Personal and community health* includes the selection of foods and eating patterns, which determine nutritional balance because nutritional balance has a direct effect on growth and development and personal well-being. *Population growth* includes the growth or

declination through the combined effects of births and deaths, and through emigration and immigration, and how populations can increase through linear or exponential growth, with effects on resource use and environmental pollution. *Natural resources* includes the understanding that the earth does not have infinite resources, increasing human consumption places severe stress on the natural processes that renew some resources, and it depletes those resources that cannot be renewed. *Environmental quality* such as materials from human societies affects both physical and chemical cycles of the earth. *Natural and human-induced hazards* in that human activities can enhance potential for hazards and acquisition of resources, urban growth, and waste disposal can accelerate rates of natural change; and *science and technology in local, national, and global challenges* in that humans have a major effect on other species. For example, the influence of humans on other organisms occurs through land use, which decreases space available to other species and causes pollution, which changes the chemical composition of air, soil, and water (NSES, http://www.nap.edu/readingroom/books/nses/html/csf912).

The NSES standards were developed for secondary education. No research has been conducted with Deaf students relative to this issue of attitudes toward the environment; nor has research been conducted with Deaf college students. It is crucial that postsecondary Deaf students be taught the important issues of the environment in order to become more aware, and therefore shape their attitudes as they decide on career paths in the future. Ideally, for every major students enroll in, environmental awareness should be addressed. For example, students who are majoring in business should see how gas prices could affect the economy, how environmental laws could affect businesses' revenues, and how weather climates could affect the economy. This example illustrates a

rationale for the importance for the present project, i.e. to measure the impact of taking a course in Environment Science on students' attitude.

This project is important in the field of Deaf Education because it examines Deaf students' attitudes toward the environment and the need for Environmental Science to be incorporated into the curriculum. Students who registered for the Environmental Science courses at NTID took it as an elective. However, they were required to pick one science course from three choices: Environmental Science, Astronomy, Biology or Forensic Science.

Project Objectives

The two main objectives of this project are 1) to measure the students' attitudes toward the environment, based on their prior experiences and knowledge, as well as on the potential impact of the Environmental Science course; and 2) to develop a curriculum that will enhance students' attitudes toward the environment. Deaf students will be taught the curriculum as a treatment between the pre- and post- measures. This questionnaire will examine student attitude changes based on information learned in one science course specifically on the environment.

Literature Review

Attitudes of Deaf Students Toward the Environment

There is no literature to date on the attitudes or perceptions of Deaf learners toward the environment. In general, there are almost no studies on the attitudes of Deaf students toward learning any kind of science. Lang and Meath-Lang (1985) wrote that, "no studies to date have focused on Deaf students' attitudes toward science" (p.3), which is the main reason why they conducted their study. They write that, "the absence of

literature on attitude research in Science Education for Deaf students implies that there have been few, if any, investigations of the perceptions Deaf students have about learning science. There is a relatively large body of attitude-achievement research for hearing students" (Lang and Meath-Lang, p. 3). Almost twenty years have passed since their work and there have been no additional studies published.

According to Lang and Meath-Lang (1985), results obtained in research with hearing students, "indicate that having positive attitudes about the subject may affect the student's achievement in scientific knowledge and process" (p. 4). In their own study, 83.3 percent of two hundred and forty-seven Deaf students responded a definite "yes" answer to the question about liking science. Several examples of student comments follow:

> "Yes, because I like to learn how environment works, how does things made of, and tell me if it is safe or not. I really like it for my life. When I become old man. I will still learn, never forget my life".
>
> "Yes, I learned more things to do. My strong interest is in astronomy. It makes me enjoy to see many stars. I love to see many galaxies through my telescope".
>
> "Yes, I like science because science really help me to understand Human or animal etc. doing. I want to know more about science before I go out of world or becoming a nurse, also want to know how baby develop also generation too".
>
> "Yes, because science give out an explanation on why do many things work that way and how. The way of thinking in your mind makes

no sense if there weren't any explanation on why and how do things happen. It would make a lot of sense if we understand it. Science can help us improve a better life and more knowledge to our brain. Science can also show you what would happen if something goes wrong we know what to do. Some of the unknown problems have not been solve yet. It also can protect us from any harmful disease, bomb, and many other things" (Lang and Meath-Lang, 1985, pg. 7-11).

These statements show that Deaf students enjoy learning about science in general and clearly show how this learning affects their attitudes, especially their daily lives outside of the classrooms.

However, the attitudes in students' individual classes or schools varied in Lang and Meath-Lang's study (1985). These two researchers found that students in some of the classes were positive in their attitudes while others were not. "When negative feelings toward science were noticeably high within a particular classroom, it was usually the result of poor teaching, according to the comments provided by the students" (Lang and Meath-Lang, p. 21). They also summarized that the "attitude of the teachers is crucial. A teacher who cringes at dissection or demonstrates a dislike for technical devices may establish an early negative bias among the students" (Lang and Meath-Lang, p. 23).

Awareness and Knowledge of Deaf Students About Environmental Issues

Several curriculum projects relevant to the focus of this present study have been summarized in the literature. For example, Deaf students have been involved in the Classroom of the Sea Project, which is a collaborative project among the American

School for the Deaf in Hartford, Connecticut, the National Technical Institute for the Deaf at Rochester Institute of Technology, and the University of Connecticut. Students were invited by a Connecticut senator to help study marine life in the Long Island Sound. The goals of the Classroom of the Sea are to enhance scientific literacy, prepare students to pursue careers in science, and enhance environmental stewardship. The investigators write that "to achieve these goals, we are developing and testing the effectiveness of authentic learning environment and problem-based learning approaches to teach science to Deaf students" (Babb, I., Lang, H., Brown, S., Scheifele, P., LaPorta-Hupper, M., Monte, D., Zheng, D., Girasoli, A., Jepson, P., and Payne, S, 2003, p. 2).

Another example of a curriculum project emphasizing environmental issues is the GLOBE Program at Model Secondary School for the Deaf in Washington, D.C., where students study the weather and atmosphere. The GLOBE Program is a hands-on environmental science and education program that unites students, educators, and scientists from around the world in studying the global environment. Teachers of the Deaf from more than 45 schools have trained at Gallaudet University in Washington, D.C for the GLOBE Program. Over 10,000 schools in more than 95 countries are participating in the GLOBE Program. GLOBE students make a core set of environmental observations at or near their school. Students learn how to report their data via the Internet to a GLOBE data processing facility, learn to use global images created from worldwide GLOBE school data, and study environmental topics in their classrooms. (http://sci.gallaudet.edu/GLOBE/mssd/mssdglobe.html)

A third example of a project related to the environment is the SOAR-High Earth System Science course that is offered for high schools throughout the country such as

Model Secondary School for the Deaf, Washington, D.C., University High School in Irvine, California, North Carolina School for the Deaf in Morganton, North Carolina, and Indiana School for the Deaf in Indianapolis, Indiana. This program has been funded by grants from The Rockwell International Corporation Trust, NEC Foundation of America, and the National Aeronautics and Space Administration. SOAR-High explores new and innovative strategies in science education and the use of technology in the classroom. This curriculum was established in 2000 as an exploration of web-based course work and collaboration. Students and teachers in distance education classes are working together to study Earth System Science. "Students learn to do science as scientists do it – a process, which involves reading, learning, experimenting, analyzing, writing, collaboration and sharing information" (http://csc.gallaudet.edu/soarhigh/SHMAABT.HTM).

The Eastern Bluebird Project at Mill Neck Manor School for the Deaf in Long Island is another example of a curriculum emphasizing the environment. Groups of students have arranged bluebird boxes on the property of Mill Neck Manor to see if they could help to record information about the migration of the bluebirds and their nesting habits. (http://www.rit.edu/~comets/pages/audiencepages/hsstudents/bluebirds.html)

While these curriculum projects have been described in the literature, there are no reports available on how awareness of these issues and concepts and attitudes were developed by the participating Deaf students.

Attitudes and Knowledge of Hearing People About the Environment

Several key studies have been published on the perceptions and attitudes of environmental issues held by hearing college students and adults. Roper Starch

Worldwide (1994) summarized that "it is important to study what is known about students' attitudes toward the environment because, "In recent years, the quality of natural environment has become an issue of concern to many adult Americans and to their offspring as well" (p. 1).

The study by Roper Starch Worldwide (1994) included 19 items, which are categorized into three environmental concerns: health problems, ecological problems and aesthetic or other problems. Some of the concerns include destruction of the ozone layer, air pollution and availability of quality drinking water, pollution from toxic dumpsites and global warming, contamination of water from fertilizers and pesticides used in farming and lead poisoning from water or old paint also related to human health.

Several other problems are more ecological in nature. These include "destruction of the rainforest, pollution of lakes, rivers, streams, polluted ocean waters and unsafe beaches, endangered animals, plants, insects, and damage to the environment from mining/cutting trees" (Roper Starch Worldwide, 1994, p. 3). There are five major environmental dilemmas we face today: 1) Not enough open areas; 2) not enough landfill space for trash; 3) littering of trash and garbage; 4) too little recycling; and 5) not enough energy.

Differences were found in the attitudes between hearing students in disadvantaged and non-disadvantaged areas. Destruction of the rainforest and not enough recycling were found to be greater concerns to non-disadvantage students than to the students from disadvantaged areas (Roper Starch Worldwide, 1994, p. 3). In contrast, shortages of quality drinking water, acid rain, lead poisoning and not having enough energy are identified by a high number of students from disadvantaged areas.

Students in non-disadvantaged areas place greater importance on protecting resources for future generations than students from disadvantaged areas. This illustrates the more limited perspective and attitudes the students demonstrate from disadvantaged areas. Nonetheless, for 13 of the 19 issues, the attitudes of students from disadvantaged and non-disadvantaged areas were similar (Roper Starch Worldwide, 1994, p. 3).

In another study, Americans adults were given a failing grade on a National Environmental Report Card. The National Environmental Education and Training Foundation (NEETF) study by Roper Starch Worldwide (1997), which included a total of 1501 adults, ages 18 and older, and assessed on attitudes, knowledge and behaviors of people in the United States.

According to the report card evaluation, two out of three survey respondents (68 percent) failed to correctly answer nine or more of 12 simple questions on the environment. Only one in ten makes the "Environmental Dean's List" with 11 or more correct answers. There is an alarming lack of knowledge on some of our most critical environmental problems: Only 23 percent of Americans are able to identify run-off as the leading cause of water pollution. Only 33 percent of Americans know that burning fossil fuels is America's primary method for generating electricity, or what impact this practice has on air quality (Roper Starch Worldwide, 1997, p. 1)

It was summarized that "Misinformation may be as much of a problem as lack of knowledge. People are two times more likely to believe (incorrectly) that factories are the main source of water pollution than they know the correct answer. Nearly half of all Americans think (incorrectly) that dams produce most of our electricity" (Roper Starch, 1997 p. 1). Knowledge of environmental issues positively influences participation in pro-

environment activities. According to Roper Starch Worldwide, people who know that garbage or trash ends up in landfills are more likely to recycle and cut down on household trash than people who do not know this fact. People who know the major source of water pollution are more likely to take action to prevent it. Adults with no children who know that cars are the major source of air pollution in the U.S., and who have alternative transportation available, are more likely to use the alternative. (Roper Starch Worldwide, p. 2).

This study also showed that people overwhelmingly want their children to be taught environmental education in their respective schools, "Fully 95% of adult Americans and 96 percent of parents support children being taught environmental education in the schools" (Roper Starch Worldwide, 1997, p. 2).

To summarize, there is a great deal of research with Deaf students in the field of Science Education, but practically nothing on attitudes of Deaf students in Environmental Science. There is also a large body of research with hearing students, and few studies on attitudes of hearing students in Environmental Science. The need for more research with Deaf students in this area is particularly critical. This present study will add to the body of knowledge of research on Deaf students' attitudes toward Environmental Science.

Method

The research question for this project is: Do Deaf students' attitudes about the environment change based on one science course focusing on the environment? This question was examined by conducting a survey with a total of 26 questions. Twenty-five questions with 5-point Likert type rating scales and one open-ended question were

included (see Appendix 1). A pilot study was conducted using the survey with five students to measure variability and the need for possible wording revisions.

Subjects include 17 Deaf students who took Environmental Science courses within the college of National Technical Institute for the Deaf (NTID), one of the 8 colleges under Rochester Institute of Technology (RIT). The students who took the Environmental Science course were working toward their Associate of Occupational Studies (A.O.S.) or Associate of Applied Studies (A.A.S.) degrees. Prior to attending NTID, students received their GEDs or diplomas from either mainstream program in their respective public schools or at a residential school for the Deaf. The students had various communication preferences, such as American Sign Language, Signed Exact English, oral, and Contact Signing. The course was taught by using Simultaneous Communication, which is spoken and signed English at the same time, to best fit each student's communication preference. Students were given no time restrictions while taking the paper and pencil survey. The survey was given to the students as pre- and post-course measures to study the possible change in attitudes.

Curriculum

This Environmental Science course covers introductory science processes using the content of environmental science as a vehicle to establish an appreciation of the scientific method, critical thinking, and problem solving. The curriculum follows the National Science Education Standards. The basic processes of observing, classifying, comparing, and measuring using metric units are addressed in both classes and laboratory using the concepts of environmental science. Weekly topics such as population

dynamics, human populations, air pollution, water pollution and waste & recycling are the overarching themes that are related to the field of environmental science. To view the curriculum online, go to http://idea3.rit.edu/jtsral/es2/index.asp. The primary reason for putting the curriculum online is that it would be widely available to all students anytime. It encourages interactive learning and assists students with the development of using technology. Another reason, just as equally important, is that the use of the website allows less use of paper, which saves trees.

The Environmental Science course grade is determined by a total of seven lab reports (40%), weekly online discussions and quizzes (10%), one midterm exam (10%), one final exam (10%), one independent research project (10%) and one team research project (10%) throughout the eleven-week course. Attendance (10%) plays an important part of the students' learning process. Homework (5%) allows students to investigate environmental issues before coming to class the next day and class participation (5%) allows students to learn new ideas from fellow classmates through active learning, writing to learn and social constructivism activities.

During lab experiments, teamwork is mandatory. Students are grouped in teams that remain the same throughout the course. There are two classes each week with 110 minutes each. The first class of the week is typically discussion and lecture, while the second class is normally used for lab experiments. All videotapes listed in the curriculum are available from the Captioned Media Program (www.cfv.org). The Captioned Media Program provides free educational media such as videotapes with closed-captions. Funding is provided by the U.S. Department of Education and is administered by the National Association of the Deaf.

First Week

The first week focuses on population dynamics, ecosystem and food chain. This topic discusses how population changes in response to environmental changes. Population dynamics is the study of periodic rises and falls in the size of a population. Overpopulation is an environmental problem. The size of population depends on reproduction or fertility rates, competition for food and space, incidence of disease, predation and climate. Population will increase when the number of births exceeds the number of deaths.

Students are challenged to think what happens to the population when the food runs out? What happens if we lack space to grow vegetable, fruit and meat? By studying a food chain, students learn how all organisms on earth are related to each other and depend on one another. If it weren't for plants and other producers, consumers would not be able to survive. If there weren't any sunlight to produce energy, there would be no plants. It is important to look at the various classifications of organisms in the food chain to understand how they relate to each other and depend on each other for life.

In addition to the first week topic, the lab experiment on testing for lead in paint compliments the overarching theme of population dynamics. Students are given five or six pieces of wood with several layers of old paint. Paint that was made before 1978 contained lead. Students learn how to use a lead kit to find out which wood (surface and below) has lead and record their findings. As part of the homework assignment, students type a lab report based on their findings. Afterwards, discussion is held on lead poisoning and how it can be potentially harmful to people, especially babies chewing on

cribs when they are teething.

As part of the first week assignment, students write a creative writing piece. The following goes: "Imagine yourself sitting in a space shuttle some million miles away from Earth. It is the year 2050. You have this specialized telescope where you can see what is happening on Earth. Write down what is going on in your mind about Earth in that year: what is happening to the environment? Technology? Population?"

This open-ended question encourages students to do some abstract thinking about what they see would happen in the future. This question gives students the opportunity to see how the growing population of humans and animals can alter the food chain. In addition to homework, students are given a ten-question quiz on how to handle data as part of an introductory exercise for students to practice on how to collect data, plug into Excel spreadsheet, and make a graph from the data in Excel.

Second Week

The second week focuses on human population. Students are challenged with the question "Why is our global population growth out of control". The world's population is now 6 billion, and every minute 247 people are born. Improvements in agriculture, medicine, and industry have caused the Earth's population to rise exponentially. Lower death rates combined with higher birth rates in some countries are raising concern for the need to control global population.

Another question students are encouraged to think about is, "How can we control population?" Population growth saw its first major break in the 1960's with the introduction of the birth control pill. Earlier this century, couples were producing 4.9

children on average. Now this number has plunged to 2.7, and in some countries like Spain, Greece, and Germany, the fertility rate is below 1.5.

Countries in trouble have started aggressive family planning programs. However, many of these programs have gone bad, causing great political problems. China has a one-child policy, which has been somewhat successful. However, their society values boys over girls, and these one-child rules have led to the abandonment, abortion, and infanticides of infant females. Couples will try continuously until they have a boy, and girls are discarded. Students in this course thus engage in a debate on whether this one-child policy should be implemented in all countries.

Students are encouraged to think about the environmental impact of the growing population. For example, since the beginning of the Industrial Revolution, the demand for fossil fuels and minerals has grown tremendously. This endeavor causes problems for the environment on a large scale. Pollution affects every part of the biosphere such as air, water, and land. These pollutants become incorporated into food chains, allowing harmful chemicals to pass from animal to animal. The delicate balance of our biosphere has been upset in a devastating way.

Lab experiment on radiation is part of the assignments for the second week. Students learn that energy changes and transfers occur all the time. Heat is a form of energy, which can change and can be transferred. Heat moves from an area of high temperature to an area of low temperature. Not all materials can absorb or radiate heat at the same rate. Students discover the heat transfer difference between the colors black and white. Also, this experiment ties in with the food chain and how energy is transferred

from one level to another through the initial process of photosynthesis. Photosynthesis is the process that converts energy in sunlight to chemical forms of energy that can be used by biological systems, such as plants. This is why plants are green. The goal of this lab experiment is to test radiation by using white and black containers to see which heats up more and faster depending on the distance of the energy source. After students collect the data, type the lab report as part of their homework.

A ten-question quiz on the ecosystem and food chain is part of the homework for the second week as a review of what they learned during the first week to check if the students comprehend the information discussed in class. Other homework consists of five essay questions such as 1) Do you think that continued growth of human population is a problem? Why or why not? 2) Suggest ways that the carrying capacity of the Earth might be increased for humans. Suggest ways that the quality of life or standard of living for all humans could be increased. 3) A 23-year old college student in 2003 will be 70 years old in 2050, the year when the human population could reach nearly 9 billion. Speculate on what life would be like for that person. Consider housing, job opportunities, cost of living, availability of resources, and recreational activities such as wilderness camping and travel. Also speculate on what kind of world that person would inhabit. Are relations with other countries likely to be stronger and more secure or weaker and more precarious than they are now? 4) What are the goals of family planning? How is family planning different from Zero Population Growth policies? 5) List some important features of China's 'one-child per family' policy. Do you think such a policy would work in India, the United States, and Mexico? Why or why not?

Students watch a 14-minute videotape, "Nature's Delicate Balance," which talks about how every element of earth's ecosystem is needed to maintain the delicate balance that supports all life forms. Groups of people and organizations work to keep and even to restore this balance. Mentions often how life on earth is interconnected and that environmental responsibility is everyone's business.

Third & Fourth Week

The third and fourth week share the same topic, air pollution. Subtopics during the third week include the level of the atmosphere, ozone layer, chlorofluorocarbons, ozone hole, international treaties, greenhouse effect, and greenhouse gases. Subtopics during the fourth week include the historical trend of global temperature, causes of global warming, how industrial revolution is responsible for global warming, why humans are largely responsible for global warming, the rise of the sea level, what would happen to Miami and Boston, what can be done to alleviate global warming, what are the alternatives to using fossil fuels, and the Clean Air Act.

As an introductory lesson to the topic air pollution, students watch a 13-minute video "The Air You Breathe," interviews with professionals and patients provide information on polluted air inside and outside, how it is caused, and what can be done about it. They also relate effects of breathing in polluted air, including asthma, emphysema, and chronic obstructive pulmonary disease and their treatments.

Also, students watch a 20-minute videotape "Ozone," which talks about years of the easy life to which people have grown accustomed have been at great cost to our environment. Scientists have learned about the devastating effects of

chlorofluorocarbons (CFCs) on the ozone layer. This process is graphically demonstrated and some research by scientists for a safer replacement chemical is explained.

The third videotape, which is 17-minutes long, "The Greenhouse Effect," focuses on the natural balance between the earth and its atmosphere is a delicate one. The industrial revolution and automobiles have tipped this balance. Scientists gathering data and using computer models are able to predict possible global warming trends due to an increased greenhouse effect. Students are challenged to think about what could happen if the average temperature increases three to five degrees? What can we do to reduce global warming?

Lab experiments for both third and fourth week are similar but use different variables. The third week lab experiment uses a computer software that stimulates an experiment by plugging in data. Students find the level of carbon monoxide in four cities that are produce from cars, buses, and factories. All four cities have different variables. Also, students find which time of the day produces most of the carbon monoxide due to traffic and speed of wind. The fourth week lab experiment, like the third-week experiment using a computer software, focuses on how the wind speed affects the level of carbon monoxide according to the numbers of cars for six years. As each year goes by, 5,000 cars are decreased. Also, students find out how much carbon monoxide is in three different times of the day according to the traffic speed. As part of the homework assignment for both third and fourth week, students type a lab report based on their findings.

As part of the homework for the third week, students answer a 5-question essay. Questions are: 1) Explain the greenhouse effect. How is it related to global climate change? What measures, if any, do you think should be taken to prevent climate change? What could developed countries do to help developing countries reduce emissions of carbon while still raising living standards? 2) What factors are contributing to the destruction of the stratospheric ozone layer? What effects could this destruction have? 3) Imagine that your community faces an air pollution problem. What steps would you recommend to reduce the pollution? Explain your choices in terms of size, location, and demographic composition of your community. 4) Summarize the air pollution problems caused by the burning of fossil fuels. What measures could we take to alleviate the unwanted consequences of fossil fuel combustion? 5) What do you think is the most pressing concern with respect to air resources? Explain.

Homework for the fourth week includes 15 multiple-choice questions quiz. This quiz is a review of what the students learned about on air pollution as well on the first two weeks, human population and population dynamics.

Fifth Week

The fifth week is the midpoint through the course and that is when the students take their cumulative midterm exam. All students are given a study guide the week prior to the midterm exam week. The exam consists of 55 multiple-choice questions and one Excel graph with given data from one of their lab exercises.

Sixth & Seventh Week

The sixth and seventh week share the same topic, which is water pollution. More time is spent on this topic due to the amount of information. During the sixth week, conservation of water is the subtopic. What is the water cycle? How can people conserve water? What are the percentages of fresh water left on Earth? Where do fresh water come from? Where are they stored? These are the general questions students are challenged to think about. Seventh week covers the human impact on the Great Lakes and ways to preserve water supply. Important terminology includes: precipitation, runoff, surface runoff, evaporation, condensation, transpiration, and storage.

As an introductory lesson to the topic of water pollution, students view a 18-minute videotape, "Problems of Conservation: Acid Rain," which talks about industrialization of North America and Europe, as well as the exhaust from automobiles, that has produced gases that turn clouds into a corrosive acid. These clouds can be carried hundreds of miles as they produce acid rain and snow, which cause drastic changes in forests, streams, and lakes. Scientists continue to identify ways to reduce environmental damage and to solve the problem of acid rain.

Students answer a 5-question essay as part of their homework for the sixth week. Questions include: 1) Why is water so important? 2) More than 71% of the Earth's surface is covered with water, yet many ecosystems and people suffer from lack of water. Explain how this is possible. 3) Differentiate between surface waters and groundwater and explain how the two are related. 4) What are the major uses of fresh water? How do

those uses affect water supplies? 5) List the eight categories of water pollution and briefly describe each.

As part of the class activity, students do an exercise online (http://livingclassrooms.org/slurrp/watercycle.html). This website allows students to fill in the blanks what level is in the water cycle. Secondly, students take a ten-question quiz on water pollution as a review. Lastly, student pair up with a partner and work on a concept map of the water cycle/precipitation.

The lab experiment for sixth week is on water bacteria (E.coli) and treatment. Students place five samples of water (tap water, bottled water, Genesee River water, Sewer water and Sewer with treatment water) on a petri dish. The bacteria will be revealed as it grows on the petri dish over a period of about 48 hours. The water sample of Sewer with treatment water has ten drops of chlorine in it. This allows students to see the difference in the water sample and how chlorine kills the bacteria. Students type a lab report based on their findings as part of the homework assignment.

For the seventh week assignment, students take a ten-question quiz about water pollution as a review. Also, students write a creative writing piece in their own words: "Pretend that you are a molecule of water going through the water cycle. What happens to you? Do you go through precipitation? Transpiration? Change in temperature (warm/cold)? Sleet? Snow? This is your own writing opportunity, feel free to write in whatever style you like".

Lab experiment for the seventh week is studies the water pollution by using computer software. In this experiment, students learn what is dissolved oxygen and

biological oxygen demand and why they are imperative for the water environment. When the water contains less than 5 parts per million (ppm) of dissolved oxygen, almost all the living organisms such as fish die. This happens when there is not sufficient oxygen available in the water, which may be caused from man-made activities such as cars and factories. Students study how the speed of water, for instance, in a river, can affect the level of dissolved oxygen. They also study how the temperature and kind of waste affect the level of dissolved oxygen.

There are three parts to this lab experiment. Part A studies water temperature at 18 degrees Celsius with untreated industrial waste dumped into a slow river at the average of 12 ppm per day. Part B studies a company that is investigating four possible sites for its new factory: Site "A" along a 14 degrees Celsius fast-flowing river; Site "B" along a 14 degrees Celsius slow-flowing river; Site "C" on a quiet 14 degrees Celsius lake; and Site "D" on a 14 degrees Celsius pond. The company will discharge an average of 12 ppm per day of untreated industrial waste directly into the water. Part C studies the average seasonal temperatures of a lake: Winter at 1 degrees Celsius; Spring at 11 degrees Celsius; Summer at 26 degrees Celsius; and Fall at 16 degrees Celsius. Students will set the dumping rate for untreated industrial waste to 10 ppm per day and see which temperature has highest tolerance for dissolved oxygen. Students type a lab report based on their findings as part of the homework assignment.

Eighth Week

Waste & Recycling is the topic for the eighth week. Municipal solid waste is another name for the trash and garbage produced by households and businesses.

Students discuss how the U.S. is generating more solid waste every year, not only because our population has increased, but also because of the increasing use of disposable materials and excessive packaging. The most common methods of disposing of solid wastes are: 1) Dumping in landfills, 2) Burning, and 3) Recycling.

First, as part of an introductory lesson to the topic of recycling and solid wastes, students watch a 17-minute videotape, "The Garbage Story," which discusses about garbage and addresses questions such as: What happens to the 200 million tons of garbage we produce annually? How is a landfill made? This video visits modern incinerators, recycling facilities, and landfills. Learn how scientists and engineers use the newest technologies to deal with one of society's oldest problems. Also, explores the health, social, environmental, and economic issues involved.

Second, students watch a 19-minute videotape, "Garbage Tale: An Environmental Adventure." It's Ernie's job to take out the garbage. He never thinks about what happens to it. One night in a dream, the trash man appears. He takes Ernie on a journey to landfills, incinerators, compost bins, and recycling centers to show what happens to garbage after it's thrown away. Recycling, reusing, and reducing what we use helps save natural resources and reduces garbage.

Third, students view a16-minute videotape, "Protecting Our Environment: Recycle," which defines recycling and explains the process. Presents a list of the most commonly recycled items. Shows how glass, aluminum cans, paper, plastics, and cars are broken down, sent through the recycling process, and manufactured into new products. Presents facts about the benefits and importance of recycling.

The discussion among students of recycling after viewing the three videotapes allows students to understand the difference and similarities between recycling and solid waste. Glass, paper, plastic, metals, food and yard wastes, textiles, and old tires are among the examples that can be recycled.

Students engage in a debate what are the pros and cons of landfills. Other subtopics are: groundwater contamination, methane production, incomplete decomposition, settling, combustion (waste to energy), advantages and disadvantages of burning solid waste, and modern waste combustion facilities.

As part of the assignment for the eighth week, students take a 3-question essay about recycling and solid waste. The questions are: 1) what kinds of unrealized resources do you use and discard in your home and your school or office? Which of these could be reused or recycled? Identify resource recovery centers in your area and find out what kind of resources they accept. 2) Compare the waste generation patterns of the United States and Canada with those of other industrial nations. What factors might be responsible for the differences? 3) Your community's landfill is slated to close in two years. You have been asked to be a member of the problem-solving team charged with devising a solid waste management plan for the community. What steps would you take? What information would you seek? What role would land filling, incineration, waste minimization, and resource recovery play in your plan?

A ten-question quiz is part of the assignment for the eighth week as a review on recycling and solid waste. Students are given a handout on how to build a compost bin as a reference if they are interested in building one for their homes.

The lab experiment involves handling trash. Each bag contains trash (solid waste) from the home of two people. Each team is given a bag. Before students do anything, each team weighs their bags. Then, students count and classify the trash into four categories: re-usable, recyclable, compost able, and other. After that, students weigh each category. Then, they classify the recyclable materials into four categories: paper, glass, metal, and plastic and weigh all four categories. After students collect their data, they will create a graph that shows the respective weights of all recyclables using Excel. From doing this experiment, students will see how much trash can actually be recycled. Students type a lab report based on their findings as part of the homework assignment.

Ninth Week

The ninth week introduces students to Deaf and Hard of Hearing Scientists in the field of environmental science, such as Botanists, Ecologists, Zoologists, and Horticulturists. An RIT professor, who has done research on Deaf and Hard of Hearing Scientists and their contributions since the 18th century, was invited to speak to the class. After the presentation, students write a creative writing piece: "Now that you have seen (faculty's name)'s presentation about Deaf and Hard of Hearing Scientists, name a few scientists that inspired you the most and why." The second class during the ninth week is when students present their team research project, which they have been working on all quarter. "The Causes of Air Pollution", "Ways Water can become polluted", "How to minimize Hazardous/Toxic Wastes", "Ways to Reduce Air Pollution", and "Ways to Save Trees", are some of the students' topics. Each team is required to turn in a 3-paged paper and present a PowerPoint based on their research findings.

Tenth Week

During the tenth week, students present their individual research projects and turn in the folder with 30 articles and short summary of each article. For the presentation, students pick five articles that interested them the most, present them to the class and open for discussion. Using PowerPoint is optional but encouraged. The second class of the tenth week is spent reviewing for the final exam. A reviewing game was set up in a way that the class was divided into two groups. A basket of questions that was covered from day one was placed in the middle. One team would ask the other team the question they drew, and if they get it right, they get a point. And, vice versa. Students enjoyed this game, they said afterwards and this helped them prepare for the final exam.

Eleventh Week

The eleventh week is when the students take their final exam. This exam is a cumulative exam on what the students learned throughout the course. The exam consists of two parts. The first part makes up of 40 multiple-choice questions and the second part makes up of three essay questions. Students have two hours and 30 minutes to take the final exam.

Development of Curriculum

The curriculum was developed on a website server, Idea3 tools, which was invented by Simon Ting. A former MSSE student, Kathleen Rozanski, helped with the graphic designs of the website through using PhotoShop. She designed environmental icons such as sun, flowers, planets, moon, house, stars, animals, recycled paper, compass,

tree, and water. Summer and fall quarters prior to teaching this curriculum during winter quarter were spent on gathering information, topics and ideas, and finalizing the curriculum before posting online. The National Science Education Standards listed important topics to address in relation to the environment. These topics were seriously taken into consideration while developing the curriculum.

Results

Originally, 23 students were registered to take the Environmental Science course. Six students withdrew during the quarter, leaving a total of 17 students who took both the pre-test and post-test attitude survey. StatView statistical software was used to perform a matched-pair t-test to examine attitude change. As shown in Table 1, the pre-test had a mean of 3.60 and standard deviation of 1.23, and the post-test resulted in a mean of 3.98 and standard deviation of 1.21. The results were significant on the .0001 level.

Table 1. Pre and Post Survey means, standard deviations, and number of participants for each survey

	M (SD)	*N*
Pre-Survey	3.60 (1.23)	17
Post-Survey	3.98 (1.20)	17

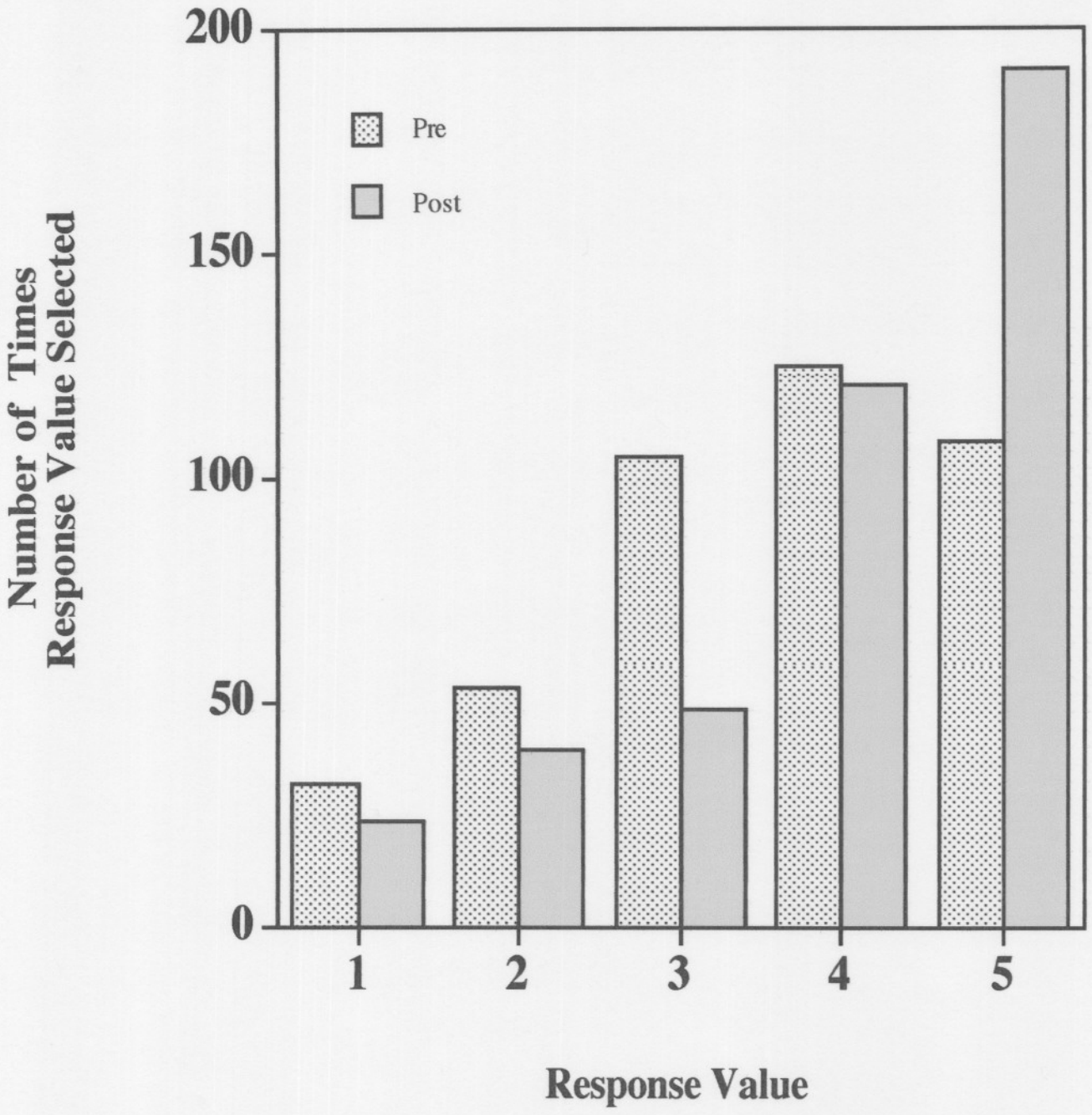
The internal consistency (Cronbach's coefficient alpha) reliability estimate for the pretest and posttest administrations of this questionnaire was 0.70 and 0.82, respectively.

Table 2. Mean Scores and Standard Deviations for Items

Item	N=17 Pre-test	N=17 Post-test
1. I enjoy learning about the Environment.	3.77 (1.03)	4.29 (1.04)
2. I enjoy teaching others about the Environment.	3.29 (1.10)	4.18 (.88)
3. I am concerned about the large, growing number of people in the United States.	3.94 (1.29)	4.00 (1.06)
4. I am concerned about the large, growing number of people in other countries.	4.00 (1.17)	3.70 (1.40)
5. The air people breathe in Los Angeles, California is safe.	3.52 (.94)	4.23 (.75)*
6. When I finish drinking from a plastic bottle or aluminum can, I recycle it.	4.41 (.50)	4.35 (.78)
7. I bike or walk to places to minimize the pollution from driving my car.	3.17 (1.18)	3.52 (1.32)
8. I save water by turning the faucet off while brushing my teeth or washing my hands.	3.23 (1.48)	4.05 (1.39)
9. I believe that recycling papers such as magazines, posters, newspapers, or trash paper is important.	4.29 (.68)	4.47 (.62)
10. I would like to drive a Sports Utility Vehicle (SUV) if I could own one.	2.00 (1.06)	2.94 (1.34)*
11. It is important to get my car inspected on a yearly basis.	3.88 (1.36)	4.00 (1.32)
13. I am concerned about deforestation	3.64 (.78)	4.52 (.80)
14. I leave my computer running when I'm not using it.	2.41 (1.41)	2.29 (1.31)*

15. Acid rain is helpful for the growth of plants and trees growing in a yard.	3.52 (1.32)	4.23 (1.09)*
16. Chlorofluorocarbons (CFCs) are safe for humans.	3.29 (1.04)	4.58 (.71)*
17. There should be a tax on plastics that cannot be reused or recycled.	2.52 (1.32)	3.29 (1.10)
18. It bothers me when I see someone littering.	3.88 (.92)	3.76 (1.30)
19. I am concerned about the water supply.	4.29 (.84)	4.29 (.68)
20. I think that biodegradable products are bad for the Environment.	2.94 (.96)	3.23 (1.52)*
21. I turn off the lights when I leave a room.	4.88 (.33)	4.70 (.47)
22. Animal manure and agricultural fertilizers help plants grow.	4.05 (.89)	4.47 (.80)
23. I am concerned about the extinction of animals.	3.76 (1.20)	4.23 (.90)
24. Burning fossil fuels is the United State is a good method for generating electricity.	3.11 (1.21)	3.47 (1.62)*
25. Factories are the main source of water pollution in America.	3.76 (1.03)	4.29 (1.04)
26. Cars are the main source of air pollution in America.	4.35 (.78)	4.23 (1.03)

* items with reverse polarity



[1] Stacey Davis of RIT/NTID Research Department created the graph.

Discussion

The results of this study indicate that deaf students' attitudes about the environment can clearly be enhanced through a well-designed course in Environmental Science with hands-on activities, frequent use of questions interspersed throughout the lessons, writing-to-learn assignments, and class discussions. While there was a general improvement in the attitudes about environmental issues, actual increases in the mean scores were found for 18 of the 25 Likert scale items.

Out of 25 items, six means did not improve. The items are "I am concerned about the large, growing number of people in other countries", "When I finish drinking from a plastic bottle or aluminum can, I recycle it," "I leave my computer running when I'm not using it," It bothers me when I see someone littering," "I turn off the lights when I leave a room," and "Cars are the main source of air pollution in America." Possible reasons for a lack of improvement in attitudes about particular issues include misunderstanding, not enough time spent on each topic, personal opinion, and lifestyle preference. For example, for the item, "I am concerned about the large, growing number of people in other countries," students may have thought that the one-child policy in China takes care of the problem and when responding to this item they may not have thought about other countries such as India, Africa and America.

Other items such as, "I leave my computer running when I'm not using it" and "I turn off the lights when I leave a room," were not directly discussed during the course. For the item "It bothers me when I see someone littering," students may not have had the experience of seeing someone littering or it is not of a concern to the students. Again, this item was not adequately discussed in class. Students learn about recycling and solid

wastes based on the information they learn from the lab experiments and the three videotapes that addressed the pros and cons of landfills.

The pre-test/post-test questionnaire was found to be very valuable for seeing where additional emphases should be placed in the future to enhance student attitudes. In addition, it is recommended that more open-ended questions be included in such a survey in order to find out why students answer certain questions the way they do.

Comparison With Roper Starch Worldwide Study

According to the Roper Starch Worldwide study (1994), only 33 percent of hearing Americans know that burning fossil fuels is American's primary method for generating electricity, or what impact this practice has on air quality. In the present study, a similar item was included. ("Burning fossil fuels in the United States is a good method for generating electricity"). The deaf students' mean scores increase from 3.11 to 3.47, indicating a gain in understanding. Related items were also included in this study. "The air people breathe in Los Angeles, California is safe," showed an increase from 3.52 to 4.23, and "I bike or walk to places to minimize the pollution from driving my car" showed an increase from 3.17 to 3.52. Through the two-week session on air quality, the students apparently learned the consequences of burning fossil fuels such as coal, oil, gas, and wood, which emits harmful chemical in the air.

However, one item related to air quality showed a slight decrease. The mean score for the item "Cars are the main source of air pollution in America," dropped from 4.35 to 4.23. Explanation for this slight decrease may be part due to the misinformation given to the students, or students may have developed their own opinions that cars may not be the main source of air pollution after doing independent study on this topic. With the current

trend of manufacturing hydrogen-powered, electric or hybrid cars, students may feel that this was not of a great concern to them. Even though this decrease was not statistically significant, such item analysis helps a classroom teacher reflect on better ways to instruct students the next time the course is taught.

Other items similar to those in the Roper study (1994) were also included in the present questionnaire. The item related to destruction of the ozone layer, "Chlorofluorocarbons (CFCs) are safe for humans," showed an increase from 3.29 to 4.58. The item on the availability of quality drinking water, "I save water by turning the faucet off while brushing my teeth or washing my hands," showed an increase from 3.23 to 4.05, and the item "I am concerned about the water supply" showed no change in the attitudes. Also, an item on global warming, "I am concerned about deforestation," showed an increase from 3.64 to 4.52.

Open-Ended Question

One open-ended question (#12) on the pre and post survey asked, "Please describe what you know about hydrogen-powered cars. Would you want one? Why or why not?" Students' responses varied.

On the pre-survey, out of the 13 who responded negatively, five students did not know what hydrogen powered cars were, "I don't know what that means," "I am unsure what they are," "Not sure," "I have no idea what is hydrogen-powered cars," "I don't know if I want one because I don't know if it's good for environment."

Six students thought that hydrogen powered cars were harmful to the environment or that the engine was too weak to drive, "No, the recent researches showed that hydrogen-powered are harmful since it still emit certain amount of gases," "No, I do not

like weak engine. I like full gas powered," "No, I am not sure it will work," "No, it has no power to haul heavy loads since I am a farmer," "I think I don't want one because it could cause fire," "Because I don't like big engine in the back of car like I have seen a new Honda hydrogen-powered car." A lack of knowledge was clearly indicated in these responses to this open-ended item.

Out of the 13 students who responded negatively on the pre-survey, two students commented that they were "neutral" and "preferred the traditional."

On the pre-survey, four students responded positively, "Maybe save your money and don't need a gas station. Use batteries for car," "Yes, I want one! Since it don't need gas. It always has electric. Save the environment A LOT!" "I wouldn't mind to save the earth and stay healthy," "Hydrogen-powered cars are good to reduce and prevent air pollution. In future, they will get better and improved speed. Several students demonstrated prior knowledge about hydrogen powered cars before taking the course. This clearly demonstrates how knowledge about the issues related to the environment influences the attitudes of the students.

On the post survey, the students' comments showed that attitudes improved overall. Not one student responded that he or she didn't know what hydrogen powered cars were. However, five out of 17 students responded that they were not interested because of preference of lifestyle or they still felt that the engine was too weak, "No, not interested in buying hydrogen-powered cars," "No, it is too weak. It has no power for hauling trailers," "No, I am not ready to buy one. Better later," "No, because I like to rely on power and the gas powered is more powerful than hydrogen-powered," "I am not familiar with this so I would not own one."

Eleven students responded positively, which exhibited knowledge and attitude about buying hydrogen powered cars, "I want one so I will save gas and paper money," "I don't mind because I never drive hydrogen-powered cars and it saves gas," "I would like to own one and to save money from use frequently of gas," "I don't mind to save the money and help the environment," "Yes, because saves gas from pollution," "Hydrogen powered cars is a mix of gas and water. Maybe because it would save gas price and help the environment too!" "Yes, because it's made of both water and electric. It would be very nice to drive in it because it causes less air pollution," "I would want one because my car must have hydrogen power for clean, wash front and back of window (I think so, not sure)," "I would want a hydrogen-powered car to save money," "Yes, it does not use fossil fuel, cleaner air," "Yes, because it does goes fast enough and I believe it would be great for environment." One student did not respond to this question.

The analysis shows a dramatic difference between the pre and post survey responses from the students on this item. Students learn about the pros and cons of hydrogen-powered cars, as well as hybrid or electric cars, in order to develop their own opinions and attitudes about this new trend. Knowledge of environmental issues positively influences participation in pro-environment activities. Knowledge of the environmental issues leads to the development of a positive attitude.

Summary

The results of the pre and post survey clearly demonstrate an improvement in the students' overall attitude about the environment. It is evident that taking a course on the environment directly influences students' attitudes. The 11-week course appeared to make a difference in attitude awareness as shown in the statistically significant difference

in the mean scores on the tests. This study provides further rationale for the need for Environmental Science courses or curriculum to be included in Deaf Education.

There are specific topics for which great improvements in the students' overall attitudes, awareness and knowledge were observed. For instance, the item "Chlorofluorocarbons (CFCs) are safe for humans," showed a great gain in the mean scores. Students at first probably did not know what chlorofluorocarbons were and how this particular chemical is destructive to the environment, especially the ozone. After learning about what chlorofluorocarbons are, where they come from and why it is destructive to the environment, the students developed a greater understanding of the chemical. The understanding and awareness of a particular information such as chlorofluorocarbons leads to the development of an appropriate attitude.

Another item showing substantial improvement is, "I would like to drive a Sports Utility Vehicle (SUV) if I could own one." Students become educated about the amount of pollution, specifically carbon monoxide, which is emitted from cars. At the beginning of the course, almost all students raised their hands when asked if they would like to own a SUV. The course focused two weeks on air pollution and what causes pollution. Students worked on two lab experiments where they saw how driving cars, depending on the wind and traffic speed, releases harmful chemical in the air. They discussed what happens to the people who live near the highways, and whether their health would deteriorate because of the poor air quality due to the level of carbon monoxide from cars. At the end of the course, students were more interested in hybrid, hydrogen-powered, or electric cars than SUV.

The item "I am concerned about deforestation" may be analyzed in a manner similar to the chlorofluorocarbon item. This item relates to knowledge about deforestation. Students may not have understood at first what deforestation means. After taking the course, they understood better that deforestation is the process of clearing trees, for the purpose of using trees for wood to build homes, to make paper, and many other products, as well as for clearing trees to land to develop homes, highways, stores, schools, etc. Simultaneously, the students became more aware of the need for preserving trees by buying recycling paper, sharing newspapers, and utilizing less packaging when buying supplies or food.

Similarly, people who know that garbage or trash ends up in landfills are more likely to recycle and cut down on household trash than people who do not know this fact. People who know the major source of water pollution are more likely to take action to prevent it. Adults with no children who know that cars are the major source of air pollution in the U.S., and who have alternative transportation available, are more likely to use the alternative.

The item "I enjoy teaching others about the Environment", showed an increase in the mean scores. This item is important since teaching others about something is usually driven from by a person's enjoyment. Clearly, this item reflects the improvement of the overall attitudes among the students about the environment.

There are several recommendations for teachers of such an Environmental Science course to impact attitudes and knowledge of students. According to the NTID Student Rating System, only 40% of the students who took the course felt that this course was very important to their major. Despite the significant improvement in attitudes, the

students may still question why such a course is important. Teachers should discuss the relationships of the course topics to students' majors in more depth.

In addition, school programs in general should give thought to ways to incorporate the issues of Environmental Science in all subjects for secondary education such as Mathematics, History, Health, Social Studies, English, Reading, and Science. This would encourage students to see how aspects of the environmental issues are related to many fields, not just science alone.

For example, in Mathematics, a teacher can show students to use the Stella models in figuring out the population dynamics and soil loss, the statistical models in figuring out the population and pollution data, the linear programming models to find the amount of sulfur dioxide emissions, and finance models to find the cost of cleanup. In History, questions such as "What environmental issues affected the United States between 1866 and 1936? What environmental issues have happened in the last twenty years in the United States? How do the issues of past and present compare to each other, and what are the differences in the solutions found for them? What solution would the student propose to solve the problem? What did the region of the United States look like where this took place?" would encourage students to see the relationship between environmental issues and history.

In English, as students become aware of environmental issues and questions, they could discuss resources available for research, e.g., informed persons, informational books, magazines, newspapers, and the Internet. They could practice looking for special features of informational books. At the end of the lesson, they record the informational

features in their journals. They add to the class list of environmental issues and problems to be researched and begin thinking about a question or issue they would like to research.

Knowledge about the environment should be everyone's concern, not just a topic for the classroom. This project shows that teachers and well-designed courses can make a difference. Our students can make a difference by applying that knowledge to their lives as well.

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Appendix 1

Survey

Please answer these questions about the Environment. Circle your choice:

1. I enjoy learning about the Environment.

Not at all A little Neutral Somewhat Yes, very much

2. I enjoy teaching others about the Environment.

Not at all A little Neutral Somewhat Yes, very much

3. I am concerned about the large, growing number of people in the United States.

Not at all A little Neutral Somewhat Yes, very much

4. I am concerned about the large, growing number of people in other countries.

Not at all A little Neutral Somewhat Yes, very much

5. The air people breathe in Los Angeles, California is safe.

Strongly Disagree Disagree Somewhat Neutral Agree Somewhat Strongly Agree

6. When I finish drinking from a plastic bottle or aluminum can, I recycle it.

Never Seldom Neutral Sometimes Always

7. I bike or walk to places to minimize the pollution from driving my car.

Never Seldom Neutral Sometimes Always

8. I save water by turning the faucet off while brushing my teeth or washing my hands.

Never Seldom Neutral Sometimes Always

9. I believe that recycling papers such as magazines, posters, newspapers, or trash paper is important.

Strongly Disagree Disagree Somewhat Neutral Agree Somewhat Strongly Agree

10. I would like to drive a Sports Utility Vehicle (SUV) if I could own one.

Strongly Disagree Disagree Somewhat Neutral Agree Somewhat Strongly Agree

Please describe why in the box below:

11. It is important to get my car inspected on a yearly basis.

Strongly Disagree Disagree Somewhat Neutral Agree Somewhat Strongly Agree

Please describe why in the box below:

12. **Please describe what you know about hydrogen-powered cars. Would you want one? Why or why not?**

Please describe why/why not in the box below:

13. I am concerned about deforestation.

Not at all A little Neutral Somewhat Yes, very much

14. I leave my computer running when I'm not using it.

Never Seldom Neutral Sometimes Always

Please describe why in the box below:

15. Acid rain is helpful for the growth of plants and trees growing in a yard.

Strongly Disagree Disagree Somewhat Neutral Agree Somewhat Strongly Agree

Please explain your answer in the box below:

16. Chlorofluorocarbons (CFCs) are safe for humans.

Strongly Disagree Disagree Somewhat Neutral Agree Somewhat Strongly Agree

17. There should be a tax on plastics that cannot be reused or recycled.

Strongly Disagree Disagree Somewhat Neutral Agree Somewhat Strongly Agree

Please describe why in the box below:

18. It bothers me when I see someone littering.

Never Seldom Neutral Sometimes Always

19. I am concerned about the water supply.

Never Seldom Neutral Sometimes Always

20. I think that biodegradable products are bad for the Environment.

Strongly Disagree Disagree Somewhat Neutral Agree Somewhat Strongly Agree

21. I turn off the lights when I leave a room.

Never Seldom Neutral Sometimes Always

22. Animal manure and agricultural fertilizers help plants grow.

Strongly Disagree Disagree Somewhat Neutral Agree Somewhat Strongly Agree

23. I am concerned about the extinction of animals.

Not at all A little Neutral Somewhat Yes, very much

24. Burning fossil fuels is the United State is a good method for generating electricity.

Strongly Disagree Disagree Somewhat Neutral Agree Somewhat Strongly Agree

25. Factories are the main source of water pollution in America.

Strongly Disagree Disagree Somewhat Neutral Agree Somewhat Strongly Agree

26. Cars are the main source of air pollution in America.

Strongly Disagree Disagree Somewhat Neutral Agree Somewhat Strongly Agree